FIG. 19

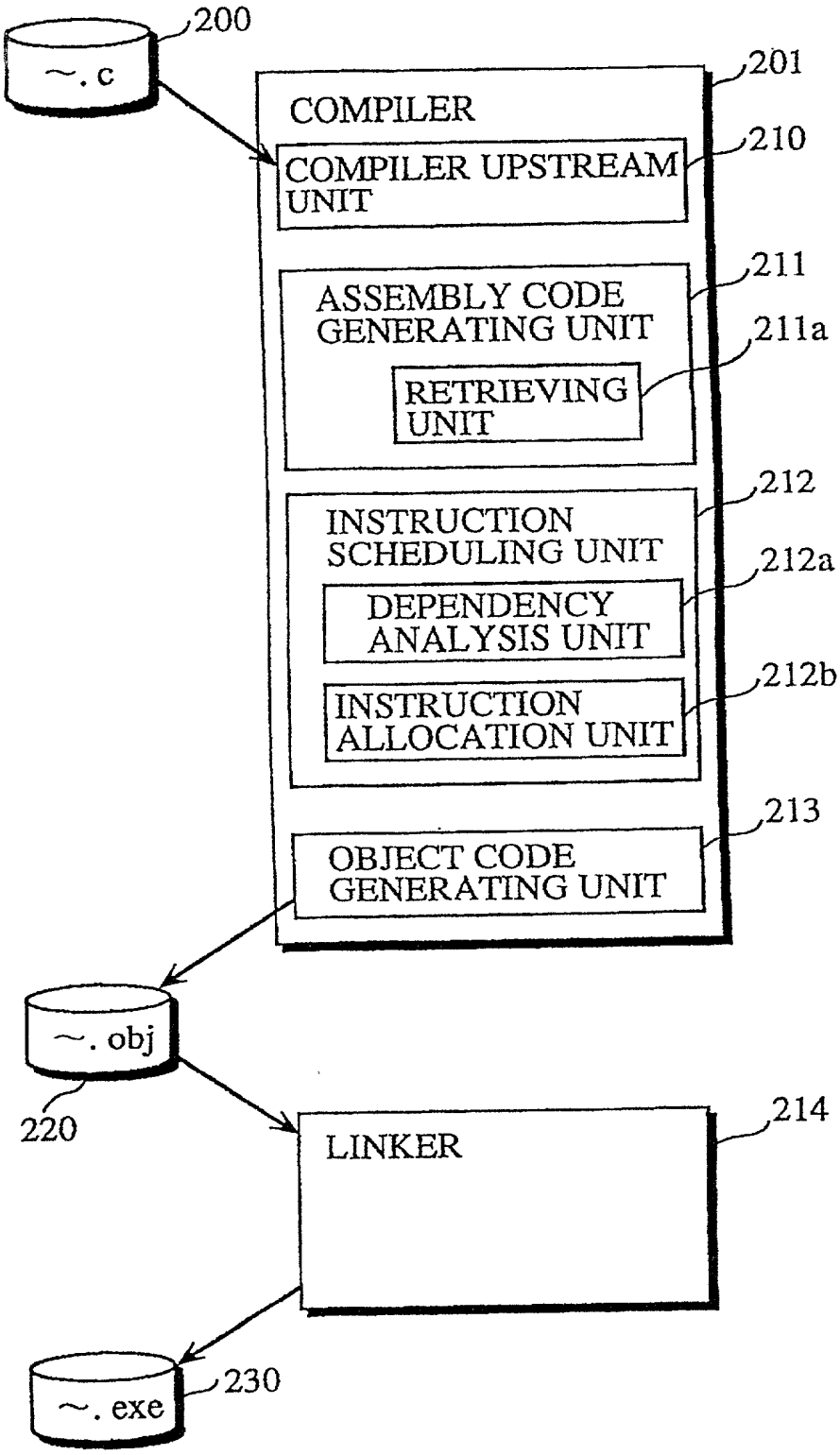
200
~. c
201
COMPILER
210
COMPILER UPSTREAM UNIT
211
ASSEMBLY CODE GENERATING UNIT
211a
RETRIEVING UNIT
212
INSTRUCTION SCHEDULING UNIT
212a
DEPENDENCY ANALYSIS UNIT
212b
INSTRUCTION ALLOCATION UNIT
213
OBJECT CODE GENERATING UNIT
~. obj
220
214
LINKER
~. exe
230

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FIG. 18

LONG-WORD INSTRUCTION	FIRST INSTRUCTION SLOT		SECOND INSTRUCTION SLOT	
1.	mov	R1, R8	sub	R2, R1
2.	mov	R0, R9	sub	R3, R0
3.	mov	R1, R10	mul	R5, R1
4.	mov	R0, R11	mul	R6, R0
5.	add	R11, R10	add	R2, R8
6.	add	R3, R9	mul	R7, R10
7.	add	R10, R1	sub	R10, R0
8.	mov	R9, R12	add	R8, R9
9.	sub	R8, R12	mul	R4, R9
10.	nop		mul	R4, R12

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FIG. 17

LONG-WORD INSTRUCTION	FIRST INSTRUCTION SLOT	SECOND INSTRUCTION SLOT
1.	adsb R2, R1	nop
2.	mov R1, R8	adsb R3, R0
3.	mov R0, R9	mul R5, R1
4.	add R9, R8	mul R6, R0
5.	adsb R2, R3	mul R7, R8
6.	add R8, R1	mul R4, R2
7.	sub R8, R0	mul R4, R3

FIG. 15

1. b [0] = a [0] + a [3]
2. b [1] = a [1] + a [2]
3. b [2] = a [1] − a [2]
4. b [3] = a [0] − a [3]
5. c [0] = (b [0] + b [1]) * f0
6. c [1] = (b [0] − b [1]) * f0
7. c [2] = b [2] * (f1 − f2) + (b [2] + b [3]) * f2
8. c [3] = b [3] * (f1 + f2) − (b [2] + b [3]) * f2

FIG. 16

VALUES OF PROGRAM VARIABLES STORED IN REGISTERS

REGISTER	VARIABLE
R0	a [0]
R1	a [1]
R2	a [2]
R3	a [3]
R4	f0
R5	f1 − f2
R6	f1 + f2
R7	f2

FIG. 13

OPERATION OF CALCULATION UNIT 110

INPUT			OPERATION CONTENT
s2_op	s2_r1	s2_r2	
(1) ADD	Rn2	Rm2	STORE Rm2+Rn2 IN Rm2
(2) SUBTRACT	Rn2	Rm2	STORE Rm2−Rn2 IN Rm2
(3) ADD	Rm2	Rn2	STORE Rn2+Rm2 IN Rn2
(4) SUBTRACT	Rn1	Rm1	STORE Rm1−Rn1 IN Rm1

FIG. 14

OPERATION OF MULTIPLICATION UNIT 111

INPUT			OPERATION CONTENT
y2_op	y2_r1	y2_r2	
MULTIPLY	Rn2	Rm2	STORE Rm2*Rn2 IN Rm2

FIG. 11

OPERATION OF DATA TRANSFER UNIT 108

INPUT			OPERATION CONTENT
X1_op	x1_r1	x1_r2	
TRANSFER	Rn1	Rm1	TRANSFER DATA FROM Rn1 TO Rm1

FIG. 12

OPERATION OF CALCULATION UNIT 109

INPUT			OPERATION CONTENT
s1_op	s1_r1	s1_r2	
(1) ADD	Rn1	Rm1	STORE Rm1+Rn1 IN Rm1
(2) SUBTRACT	Rn1	Rm1	STORE Rm1−Rn1 IN Rm1
(3) ADD	Rm1	Rn1	STORE Rn1+Rm1 IN Rn1
(4) SUBTRACT	Rn2	Rm2	STORE Rm2−Rn2 IN Rm2

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FIG. 10

OPERATION OF SELECTOR 107

INPUT a2			INPUT b2			OUTPUT		
y1_op	y1_r1	y1_r2	y2_op	x2_r1	x2_r2	s2_op	s2_r1	s2_r2
(1) NO OPERATION	--	--	ADD	Rn2	Rm2	ADD	Rn2	Rm2
(2) NO OPERATION	--	--	SUBTRACT	Rn2	Rm2	SUBTRACT	Rn2	Rm2
(3) NO OPERATION	--	--	ADD	Rm2	Rn2	ADD	Rm2	Rn2
(4) SUBTRACT	Rn1	Rm1	MULTIPLY	Rn2	Rm2	SUBTRACT	Rn1	Rm1
(5) SUBTRACT	Rn1	Rm1	NO OPERATION	--	--	SUBTRACT	Rn1	Rm1
(6) NO OPERATION	--	--	MULTIPLY	Rn2	Rm2	MULTIPLY	Rn2	Rm2
(7) NO OPERATION	--	--	NO OPERATION	--	--	NO OPERATION	--	--

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FIG. 9

OPERATION OF SELECTOR 106

INPUT a1			INPUT b1			OUTPUT		
x1_op	x1_r1	x1_r2	x2_op	x2_r1	x2_r2	s1_op	s1_r1	s1_r2
(1) ADD	Rn1	Rm1	NO OPERATION	--	--	ADD	Rn1	Rm1
(2) SUBTRACT	Rn1	Rm1	NO OPERATION	--	--	SUBTRACT	Rn1	Rm1
(3) ADD	Rm1	Rn1	NO OPERATION	--	--	ADD	Rm1	Rn1
(4) TRANSFER	Rn1	Rm1	NO OPERATION	--	--	TRANSFER	Rn1	Rm1
(5) TRANSFER	Rn1	Rm1	SUBTRACT	Rn2	Rm2	SUBTRACT	Rn2	Rm2
(6) NO OPERATION	--	--	SUBTRACT	Rn2	Rm2	SUBTRACT	Rn2	Rm2
(7) NO OPERATION	--	--	NO OPERATION	--	--	NO OPERATION	--	--

FIG. 8

OPERATION OF DECODER 105

INPUT	OUTPUT x2			OUTPUT y2		
	op	r1	r2	op	r1	r2
add Rn2, Rm2	NO OPERATION	--	--	ADD	Rn2	Rm2
sub Rn2, Rm2	NO OPERATION	--	--	SUBTRACT	Rn2	Rm2
adsb Rn2, Rm2	SUBTRACT	Rn2	Rm2	ADD	Rm2	Rn2
mul Rn2, Rm2	NO OPERATION	--	--	MULTIPLY	Rn2	Rm2
nop	NO OPERATION	--	--	NO OPERATION	--	--

FIG. 7

OPERATION OF DECODER 104

INPUT	OUTPUT x1			OUTPUT y1		
	op	r1	r2	op	r1	r2
mov Rn1, Rm1	TRANSFER	Rn1	Rm1	NO OPERATION	--	--
add Rn1, Rm1	ADD	Rn1	Rm1	NO OPERATION	--	--
sub Rn1, Rm1	SUBTRACT	Rn1	Rm1	NO OPERATION	--	--
adsb Rn1, Rm1	ADD	Rm1	Rn1	SUBTRACT	Rn1	Rm1
nop	NO OPERATION	--	--	NO OPERATION	--	--

FIG. 6

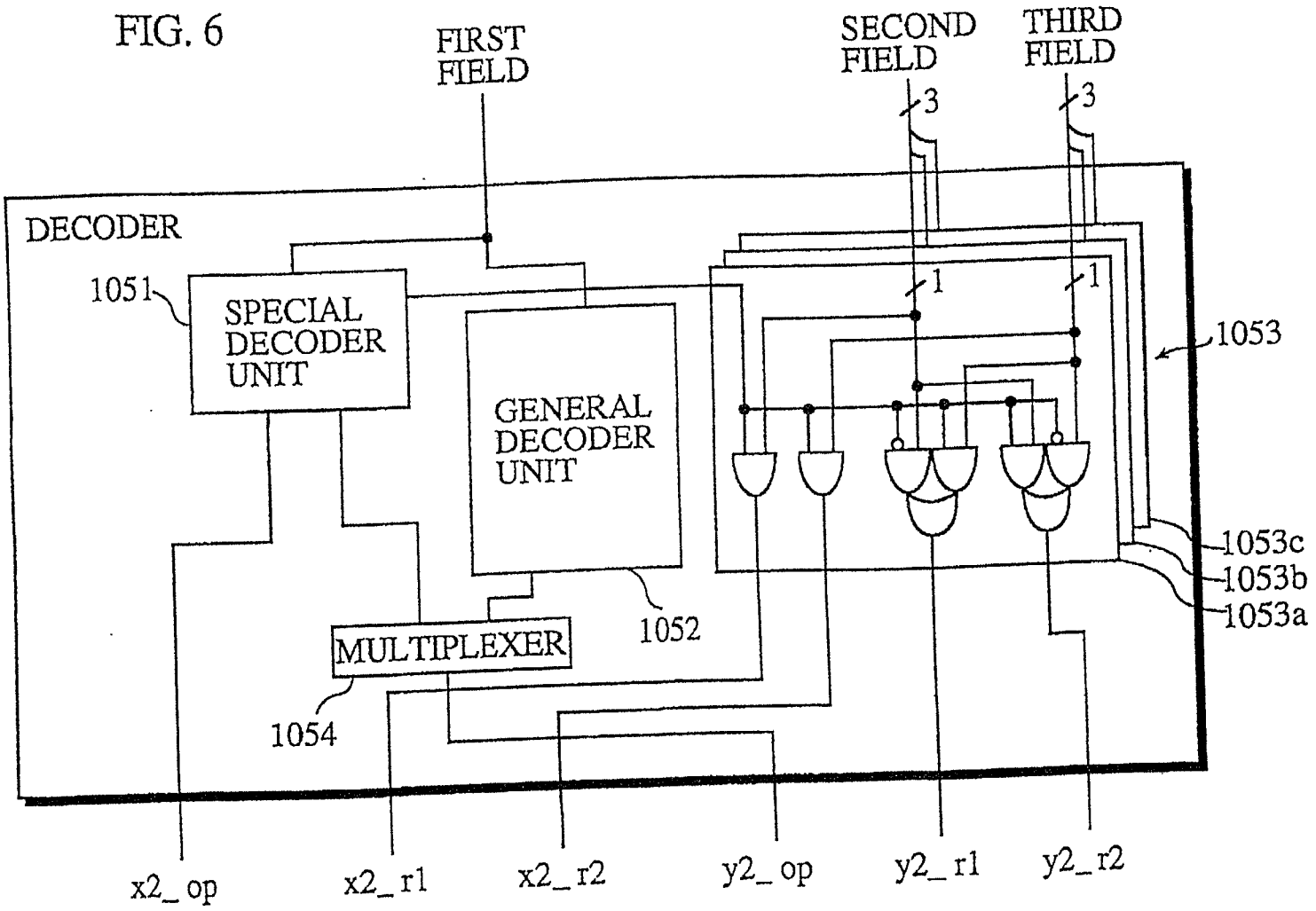
FIRST FIELD
SECOND FIELD
THIRD FIELD
3
3
DECODER
1051
SPECIAL DECODER UNIT
GENERAL DECODER UNIT
1
1
1053
1053c
1053b
1053a
1052
MULTIPLEXER
1054
x2_op
x2_r1
x2_r2
y2_op
y2_r1
y2_r2

FIG. 5

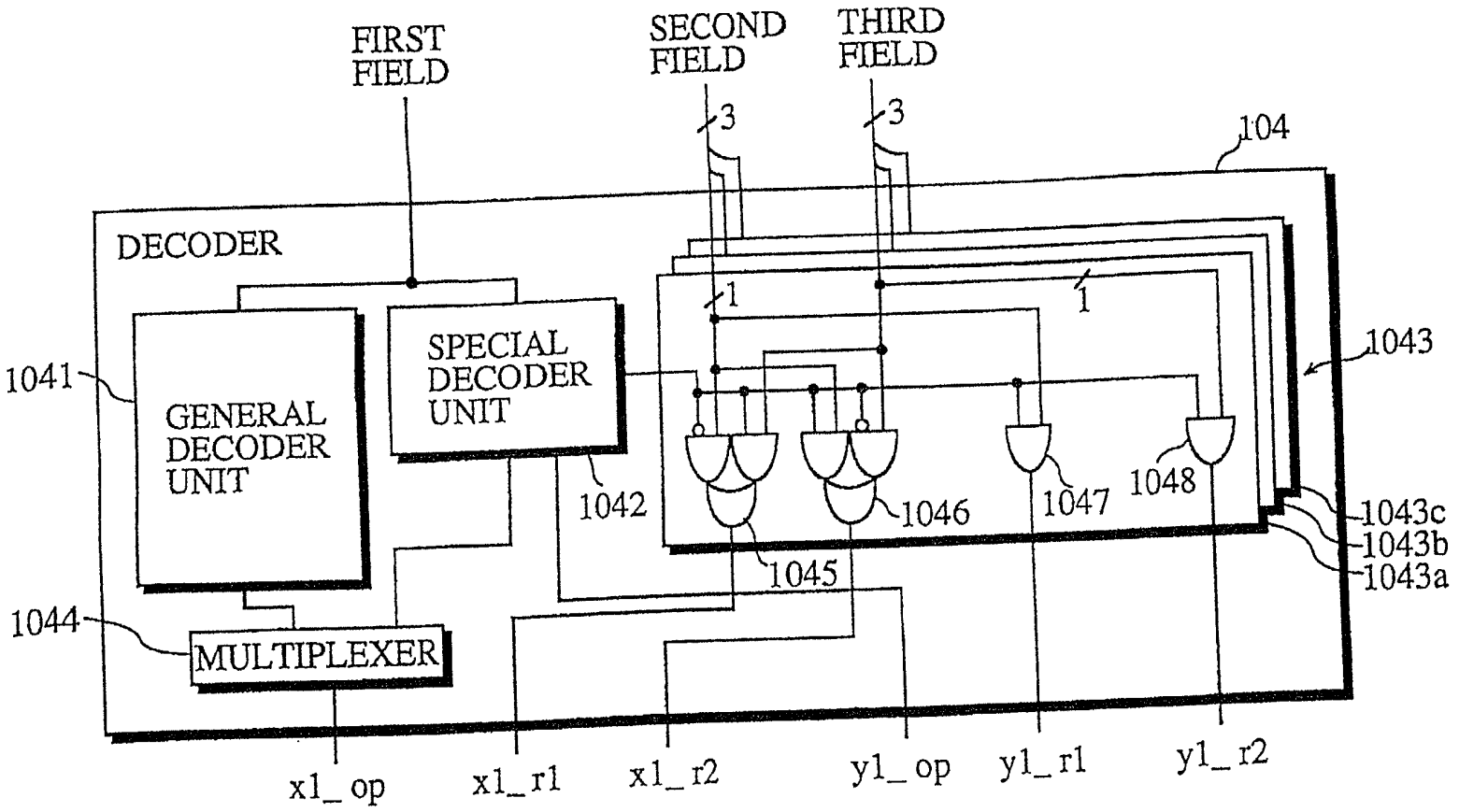
FIRST FIELD
SECOND FIELD
THIRD FIELD
3
3
104
DECODER
1
1
1043
1041
GENERAL DECODER UNIT
SPECIAL DECODER UNIT
1042
1046
1047
1048
1043c
1043b
1043a
1045
1044
MULTIPLEXER
x1_op
x1_r1
x1_r2
y1_op
y1_r1
y1_r2

FIG. 4

INSTRUCTION SETS

INSTRUCTION	MNEMONIC	PROCESSING CONTENT	ALLOCATED SLOT	
			FIRST?	SECOND?
DATA TRANSFER INSTRUCTION	mov Rn,Rm	TRANSFER DATA FROM Rn TO Rm	YES	NO
ADD INSTRUCTION	add Rn,Rm	STORE Rm+Rn IN Rm	YES	YES
SUBTRACT INSTRUCTION	sub Rn,Rm	STORE Rm−Rn IN Rm	YES	YES
ADD-SUBTRACT INSTRUCTION	adsb Rn,Rm	STORE Rm+Rn IN Rn AND Rm−Rn IN Rm	YES	YES
MULTIPLY INSTRUCTION	mul Rn,Rm	STORE Rm*Rn IN Rm	NO	YES
NO-OPERATION INSTRUCTION	nop	NO OPERATION	YES	YES

FIG. 3

INSTRUCTION

FIRST FIELD	SECOND FIELD	THIRD FIELD
nop	0	0
mov	Rn	Rm
add	Rn	Rm
sub	Rn	Rm
adsb	Rn	Rm
mul	Rn	Rm

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FIG. 2

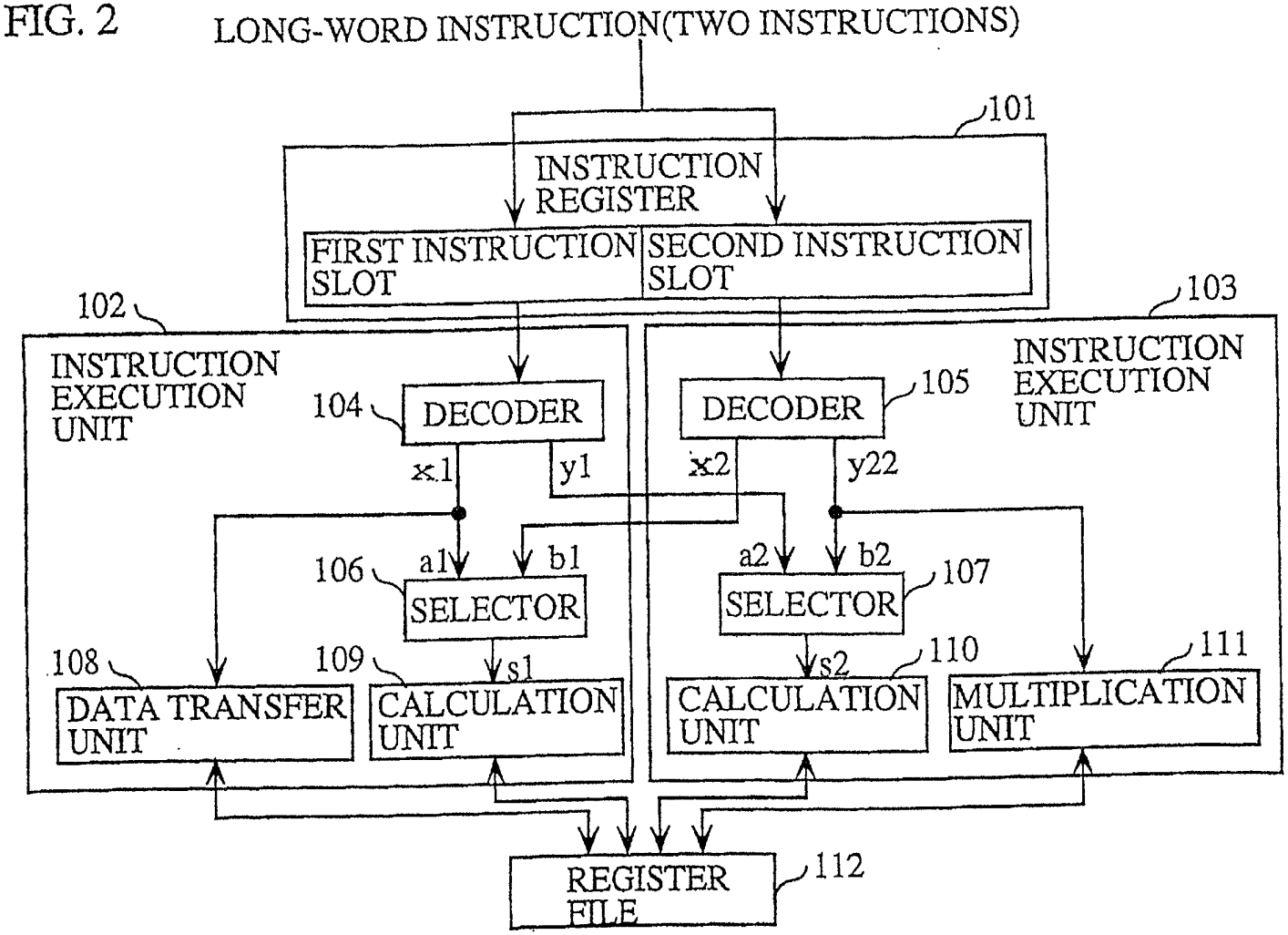
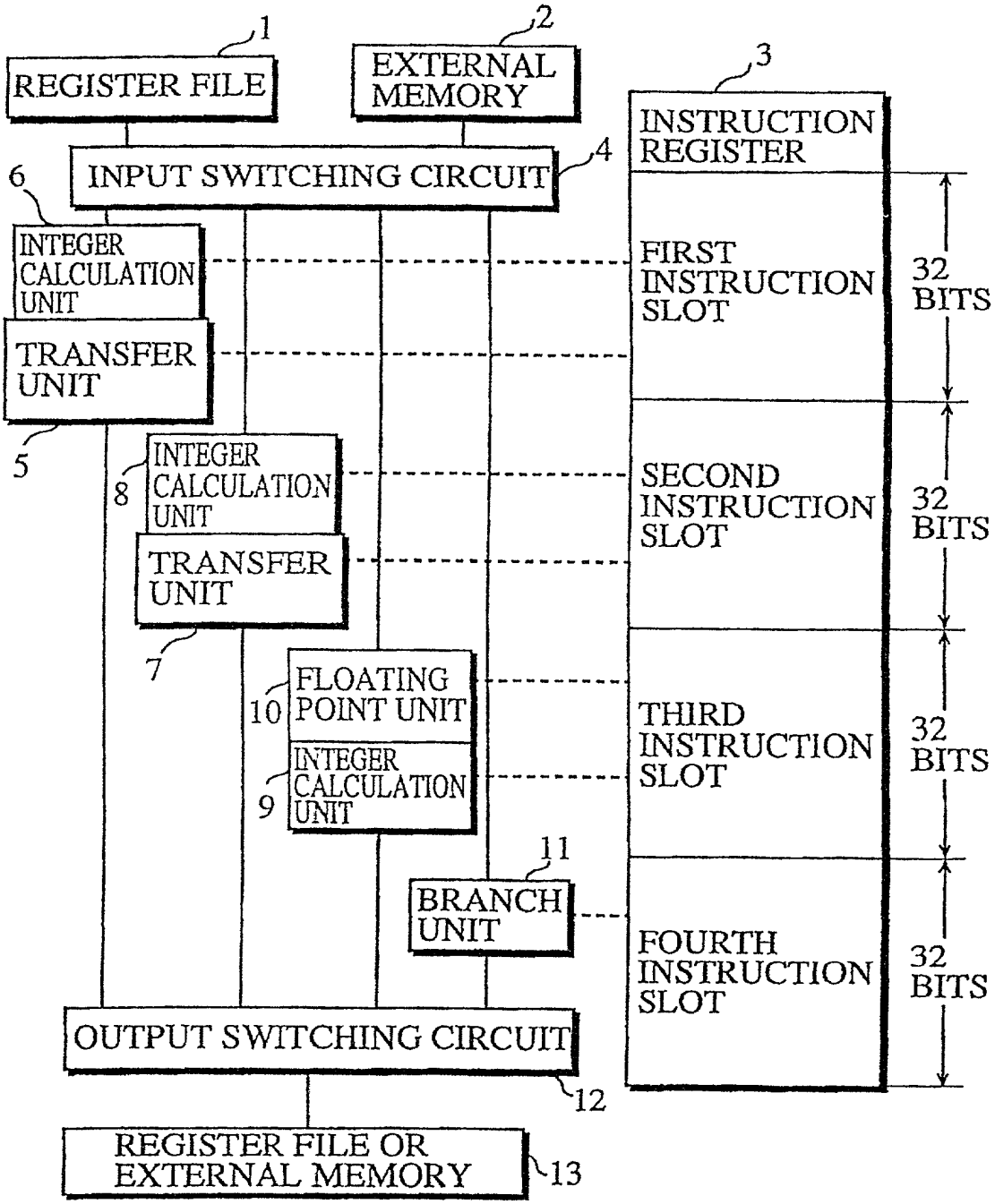


FIG. 1


1
REGISTER FILE
2
EXTERNAL MEMORY
3
INSTRUCTION REGISTER
4
INPUT SWITCHING CIRCUIT
6
INTEGER CALCULATION UNIT
TRANSFER UNIT
5
8
INTEGER CALCULATION UNIT
TRANSFER UNIT
7
10
FLOATING POINT UNIT
9
INTEGER CALCULATION UNIT
11
BRANCH UNIT
OUTPUT SWITCHING CIRCUIT
12
REGISTER FILE OR EXTERNAL MEMORY
13
FIRST INSTRUCTION SLOT
SECOND INSTRUCTION SLOT
THIRD INSTRUCTION SLOT
FOURTH INSTRUCTION SLOT
32 BITS
32 BITS
32 BITS
32 BITS